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# Drug Coverage, Utilization, and Spending by Medicare Beneficiaries with Heart Disease

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*For Medicare beneficiaries who report having heart disease, drug coverage and type of supplemental health insurance affect the likelihood of usage and costs of heart medications, but not the extent of usage. Nearly one in five does not use heart medications and of the latter, one-third lack drug coverage. Some non-users without drug coverage go without prescribed heart medications because of limited financial access. Compared to non-users with coverage, they utilize medical provider services more, and if hospitalized, their inpatient costs are twice as high. Medicare may accrue cost savings by providing drug coverage to and monitoring these at-risk beneficiaries.*

## INTRODUCTION

Prescription drug therapy is often highly effective, even critical, for managing some chronic diseases commonly encountered in the Medicare population. Because nearly one-third of all Medicare beneficiaries lack coverage for outpatient drugs, many disabled and elderly beneficiaries who stand to benefit from drug therapy may not reap its benefits (Poisal and Murray, 2001). Even in the presence of drug coverage, beneficiaries may not take or underuse prescribed drugs due to high cost-sharing requirements, benefit limitations, or other reasons.

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Currently most private Medigap policies, like Medicare, exclude drug coverage or limit the drug benefit in some way. Absence of (significant) drug coverage tends to reduce the likelihood of usage, the extent of usage, and associated expenses on prescribed drugs (Davis et al., 1999; Rogowski, Lillard, and Kington, 1999). However, for a beneficiary with a severe health condition that is clinically known to be well-managed by drug therapy, not taking prescribed medications usually leads to serious consequences. In particular, non-use or underuse risks a further (perhaps rapid) deterioration of health status and the subsequent use of other, more costly, health interventions financed by third-party payers (Soumerai et al., 1987, 1991; Soumerai and Ross-Degnan, 1999).

Recent studies suggest that type of supplementary health insurance and the presence of drug coverage influence Medicare beneficiaries' prescription medication taking behavior. Evidently, both are important factors in determining whether prescription drugs for treating individuals with hypertension are consumed, the amount of consumption, and the associated expenses (Blustein, 2000; Adams, Soumerai, and Ross-Degnan, 2001). Variations in usage and cost across insurance type and drug coverage persist even when other beneficiary characteristics, such as age group, race, and health status are accounted for.

In this analysis, we study Medicare beneficiaries who report ever having heart disease, a relatively severe health condition. We investigate whether and the

extent to which the usage and expenses on heart medications depend on two key measures of financial access: (1) the type of primary supplemental insurance and (2) drug coverage (that may not be a component of the primary supplemental policy). We examine these relationships before and after controlling for beneficiary demographic characteristics, health status, and health care utilization. Next we examine the characteristics of non-users of heart drugs by addressing two questions: (1) Among beneficiaries with heart disease, what characteristics distinguish those who take heart medications from those who do not? and (2) Of those with heart disease who do not use heart medications, are there any systematic differences between those with and without drug coverage?

Insofar as medications for a potentially fatal condition like heart disease are essential for normal or improved functioning, their consumption may be largely independent of the type of insurance coverage and the presence of drug coverage. Indeed, the more severe the medical condition and the more standard the drug therapy used for that condition, the greater uniformity in the generic type(s) and number of medications we expect. However, the total expense and out-of-pocket expense may well depend on type and extent of (drug and overall health) coverage, because of variation in the mix and price of drugs prescribed. Because of features unique to some categories of insurance type/drug coverage, some groups may be less likely to take prescribed heart drugs or take fewer of them.

## METHODS

### Sample

To examine these issues, we used the Medicare Current Beneficiary Survey (MCBS) 1998 Cost and Use File. Our sam-

ple included beneficiaries who (1) were enrolled in Medicare for the entirety of 1998 (2) were not institutionalized and (3) survived through January 1, 1999. By confining our study to full-year Medicare participants, we ensure all beneficiaries have, at minimum, access to Medicare fee-for-service (FFS) or Medicare health maintenance organization (HMO) care throughout the year. The sample excludes nursing home residents because their health care expenditure patterns are markedly higher from those of community residents, due to the cost of room and board. By omitting beneficiaries that die during the year, we exclude cases whose end-of-life health care service (specifically prescription medication) utilization and cost is atypical of the larger Medicare population.<sup>1</sup>

After these exclusions, we identified beneficiaries with heart disease if they answered yes to any one of the following questions:

- Have you ever been told by your doctor that you have angina pectoris or coronary heart disease?
- Have you ever been told by your doctor that you have myocardial infarction?
- Have you ever been told by your doctor that you have some other heart disease (aside from angina, coronary heart disease, myocardial infarction, arteriosclerosis and hypertension)?

Even if none of the questions were answered yes, if any usage of heart medications was evident, the beneficiary was included in our sample of heart disease patients. Some of these heart drug users may have hypertension or some related condition that require these medications. That is, even though they are commonly prescribed for heart disease, some heart medications may be used for other (related)

<sup>1</sup> By omitting nursing home residents and decedents, we exclude an important segment of beneficiaries with relatively severe heart disease (and who often require greater health care resources).

health conditions. As a result, our sample may overestimate the number of beneficiaries with the specified heart diseases. We thus obtain a sample of 6,761 Medicare beneficiaries with heart disease in 1998, of which 1,297 (19.2 percent) were non-users of heart medications.<sup>2</sup>

We assigned all sample persons to a single primary supplemental insurance category in the following prioritized (highest to lowest) order:

- Any Medicaid (beneficiaries with full benefits and qualified Medicaid beneficiaries).
- Any Medicare HMO (including cost, risk, and health care prepayment plan).
- Any private employer-sponsored or both private employer-sponsored and individually purchased or private HMO.
- Any private individually purchased.
- Medicare FFS-only.<sup>3</sup>

We allowed drug coverage to be a component of either the primary supplemental coverage or some other coverage, i.e., an individual with private individually-purchased supplemental insurance that excludes drug coverage may be eligible for drug benefits from the Department of Veterans Affairs. Such an individual is included in the category labeled private individually-purchased insurance with drug coverage. Also, if an individual was classified to have Medicare FFS only with drug payments made by the Department of Veterans Affairs, we omitted them from our analyses because their comprehensive drug coverage is atypical for the rest of the Medicare FFS population. (To the extent possible, we ascertained whether primary supplemental insurance included drug coverage.

<sup>2</sup> We further identified the subsample of heart patients who had an inpatient stay in 1998, and for whom inpatient diagnosis-related group (DRG) data were available (refer to the Technical Note).

<sup>3</sup> Hence, if an individual had full-year coverage from several sources, s/he would be assigned to the source (category) with the highest priority. Only if an individual was not assigned to any supplemental insurance category, s/he was assigned to Medicare FFS-only.

While the data allowed this for individuals with Medicare HMO, private employer-sponsored and private individually purchased coverage, no such linkage was possible for individuals with Medicaid or coverage from other sources.) If we could not ascertain the presence of prescription drug coverage directly, we determined it using source of payment data on prescription medications. As a result, we devised a total of 10 categories, each describing a combination of primary supplemental insurance and drug coverage.

To identify prescription drugs taken for heart disease, we used CMS' generic pharmaceutical therapeutic class variable included in the MCBS 1998 Cost and Use File. It classifies each prescription drug reported by the respondent by the type of health condition it is used for. We tracked the number and costs of prescription medications in two classes: cardiac disease and cardiovascular disease.

## Study Variables

For the sample of beneficiaries with heart disease, our primary study variable was the likelihood of consuming a heart drug. Taking the subsample of heart patients that used at least one heart medication, we then examined the number of heart drugs (prescriptions) consumed, total spending, and out-of-pocket expenses.

## Statistical Analyses

With bivariate analyses techniques, we computed the coverage rate, user rates and, among users, usage and cost of heart medications by type of supplementary insurance and presence of drug coverage. To further explore the sources of variation in the likelihood of heart drug usage among beneficiaries with heart disease, we compared the characteristics of users with non-users of

heart drugs. To investigate the role of drug coverage in the decision to not use heart drugs, we compare non-users who lack prescription drug coverage with non-users who have prescription drug coverage.

With multivariate methods, we estimated the impact of drug coverage and type of supplemental insurance on user rates and, among users, on usage and cost of heart medications, while accounting for covariates that capture beneficiary health status, demographic characteristics, and health services utilization. In estimating our statistical models, we adjusted for the MCBS' complex design, as well as for non-response. Our standard set of covariates included: age group, sex, race, income category, fair or poor self-reported health status, presence of a functional limitation (instrumental activities of daily living or activities of daily living [ADLs]), number of selected chronic diseases (Alzheimer's, arthritis, cancer, Parkinson's, or pulmonary), the presence of hypertension, diabetes, mental illness, stroke, number of visits to medical provider in 1998, and number of other medications (aside from heart medications) taken in 1998. Using the (full) sample of all beneficiaries identified to have heart disease, we first estimated user rates of heart drugs using logistic regression. For the subsample of users, we then estimated log-log regression models for the number of heart prescription medications, and their associated total, and out-of-pocket expenses, after omitting observations with values above the 99.5th percentile for each study variable. In addition to estimating the fully specified model for each study variable, we also estimated a parsimonious model to ascertain the robustness of the estimates.

Table 1 presents some basic statistics describing our sample of Medicare beneficiaries with heart disease.

## RESULTS

### Bivariate Analysis

Nearly 73 percent of Medicare beneficiaries identified to have heart disease have some form of prescription drug coverage (Table 2). Beneficiaries with private employer-sponsored supplemental insurance who also have prescription drug coverage represented the largest proportion (35.2 percent) of the sample while the smallest (less than 1 percent) had Medicare FFS-only with prescription drug coverage from other sources (figures calculated from Table 2 full sample estimates). Compared with users of heart prescription medications, a larger proportion of non-users of heart medications lack drug coverage (24 versus 38 percent). Notably, beneficiaries with Medicare FFS-only (i.e., without any supplemental health coverage) are more commonly non-users (10 percent) than users (6 percent).

Among beneficiaries identified to have heart disease, the user rate of heart medications averaged 80 percent (Table 3). Overall, beneficiaries with prescription drug coverage indicate a user rate more than 10 percentage points higher than those without the coverage (83 versus 72 percent). Beneficiaries without drug coverage showed a wider range in user rates (45 to 79 percent) than beneficiaries with drug coverage (81 to 100 percent). User rates for heart medications were the lowest for individuals that do not enroll in Medicare managed care yet rely on public sources of health insurance and lack drug coverage, i.e., Medicaid/ Medicare dually eligible beneficiaries without drug coverage (45 percent) and Medicare FFS-only beneficiaries without drug coverage (65 percent). Regardless of the type of supplemental insurance, user rates of heart prescription medications rise in the presence of the

**Table 1**  
**Descriptive Statistics on Medicare Beneficiaries with Heart Disease: 1998**

Statistic	Percent	Standard Error
<b>Outcome Variables<sup>1</sup></b>		
Heart Drug User Rate	80.0	0.7
	Average	
Heart Drug Usage (Number of PMs)	8.6	0.199
Heart Drug Total Expense	\$383	8.694
Heart Drug Out-of-Pocket Expense	\$173	5.114
<b>Health Insurance<sup>1</sup></b>		
Any Outpatient Prescription Drug Coverage	72.9	1.0
Medicare FFS and Medicaid	12.9	0.7
Medicare Health Maintenance Organization	17.5	0.8
Medicare FFS and Private-Employer Sponsored	38.5	1.0
Medicare FFS and Private Individually Purchased	24.4	0.8
Medicare FFS only	6.8	0.5
<b>Health Care Utilization and Cost</b>		
<b>User Rate<sup>1</sup></b>		
		Average
Inpatient Hospital (IP)	0.216	0.009
Medical Provider (MP)	0.982	0.003
Outpatient Hospital (OP)	0.722	0.009
Prescription Medication (PM)	0.975	0.003
<b>Use Count</b>		
IP Stays ( <i>n</i> =1,547)	1.7	0.046
MP Visits ( <i>n</i> =6,643)	24.5	0.576
OP Visits ( <i>n</i> =4,924)	6.1	0.309
All PMs ( <i>n</i> =6,604)	30.5	0.591
Non-Heart PMs <sup>2</sup> ( <i>n</i> =6,328)	22.7	0.480
<b>Total Expense (Service Users)</b>		
IP Stays ( <i>n</i> =2,510)	7,226	390.5
MP Visits ( <i>n</i> =6,662)	2,459	75.3
OP Visits ( <i>n</i> =5,348)	1,188	89.5
All PMs ( <i>n</i> =6,629)	1,181	26.4
Non-Heart PMs ( <i>n</i> =6,405)	824	23.7
<b>Health Status<sup>1</sup></b>		
Instrumental Activities of Daily Living (ADLs)	22.9	0.9
1 or 2 ADLs	14.4	0.7
3 or More ADLs	6.7	0.5
1 or 2 Chronic Conditions	74.0	0.8
3 or More Chronic Conditions	6.1	0.4
Diabetes	21.3	0.8
Hypertension	72.4	1.0
Mental Illness	6.7	0.4
Past Smoker	50.0	1.0
Current Smoker	12.3	0.7
Stroke	14.1	0.6
Fair or Poor Self-Reported Health Status	31.0	1.1

See footnotes at end of table.

**Table 1—Continued**  
**Descriptive Statistics on Medicare Beneficiaries with Heart Disease: 1998**

Statistic	Percent	Standard Error
<b>Demographics<sup>1</sup></b>		
Female	55.8	0.8
Under Age 65	9.9	0.5
65-74 Years	45.1	0.9
75-84 Years	35.3	0.8
White	82.1	0.7
Black	8.7	0.4
Married	54.2	0.9
Urban Residence	75.2	0.5
Income Less than \$10,000	21.8	0.8
\$10,000-\$14,000	16.7	0.7
\$15,000-\$19,000	13.3	0.7

<sup>1</sup> n=6,761.

<sup>2</sup> Non-heart PMs refers to prescription drugs aside from heart medications.

SOURCE: Sharma, R., Liu, H., and Wang, Y.: Calculations from the Medicare Current Beneficiary Survey Cost and Use File, 1998.

coverage. The most pronounced jumps are evident for the dually eligible beneficiaries (42 percentage points) and those with Medicare-FFS only (35 percentage points), suggesting that these groups' decision to use heart medications is affected by the absence of prescription drug coverage.<sup>4</sup>

Provided a beneficiary uses heart medications, the presence of drug coverage does not show any systematic direction of impact on the number of heart medications that applies across all supplemental insurance categories (Table 4). For dually eligible beneficiaries, beneficiaries with private individually purchased coverage, or those with Medicare FFS-only, the number of prescription medications used in the presence of prescription drug coverage is higher than the amount used in its absence (12.2/8.9, 11.4/9.8, 11.7/10.0, respectively). To the extent these beneficiaries face the greatest financial access barriers, the data suggest the existence of pent-up demand by those lacking drug coverage, especially dually eligible beneficiaries without coverage. Among users, the number of heart prescription medications consumed lies between 10.2 and 10.5 across insur-

ance categories, except for dually eligible beneficiaries, whose average consumption is higher (11.9) (perhaps due to relatively poor health status). Hence, given the essential nature of these drugs, provided some usage occurs, the extent of consumption does appear to be relatively independent of type of insurance or prescription drug coverage. For users of heart medications, total spending averages \$465 and exhibits a range across insurance categories from \$277 (Medicaid without prescription drug coverage) to \$545 (private employer-sponsored with prescription drug coverage) (Table 4). Within each insurance category, total spending on heart drugs rises with prescription drug coverage, with dually eligible beneficiaries and those with Medicare FFS-only indicating marked increases (64 and 40 percent), reflecting greater average utilization (demand) by these groups in the presence of prescription drug coverage. Notably, there is no statistically significant difference in total expense between Medicare HMO enrollees with prescription drug coverage and those without the coverage. For users of heart medications, out-of-pocket expense averages \$205 overall (44 percent of average total expense), and indicates a range of \$73 (Medicaid with prescription

<sup>4</sup> Beneficiaries with Medicare-FFS only may have prescription drug coverage from other sources such as State pharmaceutical assistance programs, private and/or other public discount programs and charities.

**Table 2**  
**Health Insurance and Prescription Drug Coverage Rates for Medicare Beneficiaries with Heart Disease, 1998**

	Full Sample		Users		Non-Users				
	Overall n=6,761	With Coverage <sup>1</sup> n=4,848	Without Coverage <sup>2</sup> n=1,913	Overall n=5,458	With Coverage n=4,071	Without Coverage n=1,387	Overall n=1,073	With Coverage n=738	Without Coverage n=335
Supplemental Health Insurance									
Medicaid	12.9 (0.69)	82.1 (1.94)	17.9 (1.94)	12.9 (0.78)	89.9 (1.45)	10.1 (1.45)	13.1 (1.46)	51.7 (6.58)	48.3 (6.58)
Medicare Health Maintenance Organization	17.5 (0.84)	94.6 (1.29)	5.5 (1.29)	17.6 (0.95)	94.9 (1.16)	5.1 (1.16)	17.0 (1.65)	93.1 (2.99)	6.9 (2.99)
Private-Employer Sponsored	38.5 (1.02)	91.4 (1.00)	8.6 (1.00)	39.1 (1.03)	92.4 (1.03)	7.6 (1.03)	35.9 (1.92)	87.0 (2.61)	13.0 (2.61)
Private Individually Purchased	24.4 (0.85)	40.0 (1.75)	60.0 (1.75)	24.6 (1.02)	41.5 (2.05)	58.5 (2.05)	23.5 (1.49)	33.3 (4.98)	66.7 (4.98)
Medicare Fee-for-Service Only	6.8 (0.52)	12.5 (2.09)	87.5 (2.09)	5.9 (0.53)	18.0 (2.93)	82.0 (2.93)	*10.4 (1.23)	0.00 (0.00)	100.0 (0.00)
All Categories <sup>3</sup>	100.1 —	72.9 (0.96)	27.1 (0.96)	100.0 —	75.7 (1.04)	24.3 (1.04)	100.1 —	61.8 (2.04)	38.2 (2.04)

\* The difference between overall share for users and non-users is statistically significant at  $p < 0.05$ .

<sup>1</sup> This column indicates the percentage of the category's overall share that have prescription drug coverage.

<sup>2</sup> This column indicates the percentage of the category's overall share that lack prescription drug coverage.

<sup>3</sup> Total for all categories may not equal the sum of all categories due to rounding errors.

NOTE: Standard errors are shown in parentheses.

SOURCE: Sharma, R., Liu, H., and Wang, Y.: Calculations from the Medicare Current Beneficiary Survey Cost and Use File, 1998.

**Table 3**

**Heart Drug User Rate, by Health Insurance Status for Medicare Beneficiaries with Heart Disease, 1998**

	User Rate		
	Overall n=6,761	With Coverage n=4,848	Without n=1,913
Supplemental Health Insurance			
		Percent	
Medicaid	80 (2.1)	87 (1.8)	145 (6.4)
Medicare Health Maintenance Organization	81 (1.9)	81 (1.9)	75 (8.0)
Private-Employer Sponsored	81 (0.9)	82 (1.9)	272 (4.9)
Private Individually Purchased	81 (1.6)	84 (2.8)	79 (2.0)
Medicare Fee-for-Service Only	69 (3.0)	100 (0.0)	165 (3.3)
All Categories	80 (0.7)	83 (0.7)	272 (1.7)

<sup>1</sup> Difference between beneficiaries with prescription drug coverage and those without prescription drug coverage is significant at  $p < 0.05$ .

<sup>2</sup> Difference between beneficiaries with prescription drug coverage and those without prescription drug coverage is significant at  $p < 0.10$ .

NOTE: Standard errors are shown in parentheses.

SOURCE: Sharma, R., Liu, H., and Wang, Y.: Calculations from the Medicare Current Beneficiary Survey Cost and Use File, 1998.

drug coverage) to \$432 (private employer-sponsored without coverage). As expected, within a given insurance category, out-of-pocket expense falls in the presence of PM coverage, but the extent of the fall depends on the type of supplemental insurance. From the data in Table 4, we calculate that dually eligible beneficiaries exhibit the largest percentage reduction in out-of-pocket expenses (225 percent), followed by those with private employer-sponsored coverage (204 percent), both groups that typically have comprehensive coverage. In contrast, due to the relatively few Medigap policies that include drug coverage and significant cost sharing required by those offering coverage, beneficiaries with private individually-purchased coverage indicate the smallest reduction (32 percent).

**Multivariate Analysis**

After accounting for beneficiary health status, demographic characteristics, and health services utilization, many of the previously mentioned findings are confirmed. While multivariate analyses also indicate

that the presence of drug coverage raises the likelihood of taking heart medications, the type of supplemental insurance (independent of drug coverage) does not have a statistically significant impact (Table 5). (Based on our models, after controlling for type of supplemental insurance and drug coverage held by the beneficiary, s/he who exhibits one or more of the following characteristics is more likely to take heart medications: age 75 or over, have hypertension or diabetes, have more visits to a medical provider, and take more prescription medications [besides heart medications]. In contrast, beneficiaries are less likely to take heart medications if they exhibit one or more of the following—under age 65, have at least one functional limitation, have two or more chronic diseases, have poor self-reported health status, or have mental illness. Hence, beneficiaries in poorest health, who are often among the disabled [under age 65], are the least likely to take heart medications.) Once again, neither PM coverage nor type of insurance affect the average number of heart medications consumed, provided at least one is used (data

**Table 4**  
**Usage and Costs of Heart Medications, by Health Insurance Coverage for Medicare Heart Drug Users: 1998<sup>1</sup>**

	Average Number of Users				Average Total Expense				Average Out-of-Pocket Expense					
	With		Without		With		Without		With		Without			
	Coverage	n	Coverage	n	Coverage	n	Coverage	n	Coverage	n	Coverage	n		
Supplemental Health Insurance	Overall	n=5,407	12.2 (0.49)	n=4,025	89.9 (1.13)	1,382	Overall	n=5,405	\$454 (22)	4,020	Overall	n=5,404	\$73 (9)	4,047
Medicaid		11.9 (0.46)	10.3 (0.35)	10.2 (0.35)	10.5 (0.35)	10.5 (0.35)		\$436 (21)	360 (16)	538 (15)	\$89 (8)	2377 (43)	303 (7)	2399 (16)
Medicare Health Maintenance Organization		10.3 (0.35)	10.3 (0.37)	10.8 (1.39)	10.6 (0.81)	10.6 (0.81)		360 (16)	360 (16)	538 (15)	146 (7)	346 (44)	137 (7)	2309 (43)
Private-Employer Sponsored		10.2 (0.35)	10.1 (0.39)	10.6 (0.81)	10.6 (0.81)	10.6 (0.81)		538 (15)	545 (16)	538 (15)	164 (7)	3458 (43)	142 (7)	2432 (41)
Private Individually Purchased		10.5 (0.35)	11.4 (0.55)	11.4 (0.55)	11.4 (0.55)	11.4 (0.55)		463 (16)	506 (31)	463 (16)	359 (11)	3433 (21)	303 (21)	2399 (16)
Medicare Fee-for-Service Only		10.3 (0.69)	11.7 (1.56)	11.7 (1.56)	10.0 (0.75)	10.0 (0.75)		365 (25)	476 (56)	365 (25)	283 (24)	2341 (30)	173 (34)	2308 (27)
All Categories		10.5 (0.21)	10.7 (0.25)	10.7 (0.25)	99.9 (0.27)	99.9 (0.27)		465 (9)	484 (11)	465 (9)	205 (5)	2406 (14)	152 (5)	2373 (12)

<sup>1</sup> Observations with values above the 99.5th percentile for the number of heart prescription drug, total and out-of-pocket expense, respectively, were omitted.

<sup>2</sup> Difference between users with prescription drug coverage and users without prescription drug coverage is statistically significant at  $p < 0.05$ .

<sup>3</sup> Difference between users with prescription drug coverage and users without prescription drug coverage is statistically significant at  $p < 0.10$ .

NOTE: Standard errors are shown in parentheses.

SOURCE: Sharma, R., Liu, H., and Wang, Y.; Calculations from the Medicare Current Beneficiary Survey Cost and Use File, 1998.

**Table 5**  
**Logit of a Medicare Beneficiary with Heart Disease Taking Any Heart Medication**

Variable	Model 1				Model 2		
	Mean	Estimate	Standard Error	P-Value <sup>1</sup>	Estimate	Standard Error	P-Value <sup>1</sup>
Intercept		-0.67	0.025	0.008	-0.61	0.221	0.007
Prescription Drug Coverage	0.727	0.78	0.169	0.000	0.77	0.169	0.000
Medicaid	0.126	-0.36	0.263	0.174	-0.36	0.265	0.181
Medicare Health Maintenance Organization	0.175	-0.37	0.283	0.198	-0.40	0.274	0.145
Private Employer-Sponsored	0.386	-0.33	0.259	0.210	-0.38	0.246	0.126
Private Individually Purchased	0.245	-0.05	0.229	0.813	-0.10	0.222	0.656
Under 65 Years	0.097	-0.56	0.207	0.008	-0.53	0.207	0.012
75-84 Years	0.354	0.31	0.114	0.008	0.32	0.114	0.006
85 Years or Over	0.098	0.31	0.161	0.054	0.33	0.159	0.038
Female	0.558	-0.08	0.105	0.450	NA	NA	NA
Black	0.087	0.12	0.181	0.499	NA	NA	NA
Other Race	0.091	-0.09	0.211	0.657	NA	NA	NA
Income Less than \$10,000	0.216	0.11	0.163	0.486	NA	NA	NA
\$10,000-\$14,000	0.167	0.17	0.136	0.215	NA	NA	NA
\$15,000-\$19,000	0.133	0.15	0.166	0.366	NA	NA	NA
Fair or Poor Self-Reported Health Status	0.303	-0.20	0.121	0.097	-0.19	0.118	0.104
Instrumental Activities of Daily Living (ADLs)	0.227	-0.19	0.118	0.108	-0.20	0.118	0.090
1 or 2 ADLs	0.143	-0.36	0.155	0.024	-0.37	0.152	0.017
3 or More ADLs	0.066	-0.38	0.173	0.030	-0.42	0.177	0.019
2 Chronic Diseases	0.272	-0.29	0.131	0.032	-0.29	0.131	0.031
3 or More Chronic Diseases	0.059	-0.31	0.191	0.104	-0.31	0.190	0.112
Hypertension	0.722	1.31	0.102	0.000	1.31	0.103	0.000
Diabetes	0.211	0.28	0.134	0.039	0.29	0.132	0.031
Mental Illness	0.067	-0.44	0.205	0.034	-0.45	0.205	0.030
Stroke	0.140	-0.18	0.153	0.248	NA	NA	NA
Visits to Medical Provider <sup>2</sup>	2.639	0.18	0.046	0.000	0.17	0.046	0.000
Number of Other Medications <sup>2</sup>	2.746	0.27	0.029	0.000	0.26	0.029	0.000

<sup>1</sup> Probability > chi-square statistic.

<sup>2</sup> For non-categorical variables, the log of the numerical value is used as an independent variable.

NOTES: NA is not applicable. Model 1 is a logit model estimating the likelihood of a Medicare beneficiary with heart disease taking any heart medication, *n*=6,699. Model 2 is a more parsimonious logit model of the same outcome variable, *n*=6,699.

SOURCE: Sharma, R. and Liu, H., Westat and Wang, Y., American Society of Health-System Pharmacists, 2002.

not shown, but is available on request from the authors). (Our models indicate that users with one or more of the following characteristics consume relatively more heart medications: age 85 or over; income less than \$10,000; have hypertension, diabetes or stroke; and use a large number of other prescription medications. Conversely, users with one or more of the following consume relatively fewer heart medications—age under 65, females, other race/ethnic group, three or more functional limitations, two or more chronic diseases, and more frequent medical provider visits. Again, beneficiaries with poor health status, often the disabled, tend to consume fewer heart medications, if any are consumed at all.)

Drug coverage increases total expenses on heart drugs, as in the bivariate analyses (available on request from the authors). However, the impact of type of supplemental insurance on total expense is not consistent (in either direction or magnitude) across insurance categories. After accounting for prescription drug coverage and other covariates, total expense does not significantly differ between dually eligible beneficiaries and those with Medicare FFS only. In contrast, Medicare HMO enrollees incur lower total expense, perhaps the outcome of pharmaceutical benefit management techniques HMOs practice and/or favorable selection. Those with private, particularly employer-sponsored,

insurance incur higher total expense (data not shown, but is available on request from the authors). Insofar as the number of prescription medications consumed remains relatively constant across insurance categories, observed variations in total expense largely reflect variations in the extent of drug coverage and in the mix (or price) of drugs consumed or prescribed. Hence, our findings indicate that these key aspects of prescription medications may differ considerably according to each beneficiary's type of supplemental health insurance, all else held constant. (Our analyses indicate that beneficiaries with one or more of the following characteristics have higher total expense on heart drugs—with hypertension, diabetes, stroke, and consume a larger number of other medications. In contrast, beneficiaries with one or more of the following characteristics incur lower total expense on heart drugs—age 65 or under, age 75 or over, other race/ethnic group, income less than \$19,000, fair or poor self-reported health status, and three or more chronic diseases. Evidently, beneficiaries with low income and poor health status incur lower total expense on heart drugs, even after accounting for drug coverage and type of insurance.)

For beneficiaries who incur some out-of-pocket expense for heart prescription medications, the presence of drug coverage reduces out-of-pocket expenses, but the extent of the reduction depends on type of insurance (data not shown, but is available on request from the authors). After accounting for the presence of drug coverage and other covariates, no statistically significant differences in out-of-pocket costs are evident across Medicare FFS-only, Medicare HMO, and private employer-sponsored coverage. Beneficiaries with private individually-purchased insurance incur the highest out-of-pocket expense perhaps because of high cost-sharing

requirements this type of policy often entails. Those with Medicaid, who typically face minimal cost sharing, incur the lowest. (Our models indicate that beneficiaries with one or more of the following characteristics have higher out-of-pocket expenses on heart prescription medications—hypertension and larger number of other medications. Out-of-pocket expenses are lower for beneficiaries with one or more of the following—age 75-84, three or more functional limitations [ADLs], and mental illness.)

### **Users and Non-Users of Heart Drugs**

Of beneficiaries who report having heart disease, we compared some characteristics of those who use heart medications with those who do not (data available on request from the authors). About 24 percent of heart drug users lack prescription drug coverage, and many of these have Medicare FFS only (20 percent) or private individually-purchased insurance (59 percent). In contrast, 38 percent of non-users lack prescription drug coverage, most of whom have one of the previously mentioned sources of coverage or Medicaid (27, 41, and 17 percent respectively). A comparison shows that relative to non-users, users of heart drugs are more likely to use all four health care categories: (1) inpatient hospital (IP), (2) outpatient hospital (OP), (3) medical provider (MP), and (4) prescription medicines. When used, medical provider services and prescription medications are more intensively utilized by users of heart drugs. Moreover, relative to non-users, users are more likely to have one or more of the following characteristics: female, age 75 or over, have diabetes or hypertension. Conversely, heart drug users are less likely to be under age 65, or have mental illness, or be a current smoker.

Among heart patients who apparently do not use heart medications, we compared those with drug coverage (who may choose not to take these medications, even though they have access to them) with those without coverage (who, in absence of other financial resources, may not have access to needed drugs). Non-users without drug coverage have lower user rates for medical provider services and all prescription medicines relative to non-users with coverage. When used, medical provider services are utilized more intensively by non-users lacking coverage relative to those with coverage although the associated total expense is apparently about the same. Strikingly, on account of greater expected inpatient usage (i.e., the product of IP user rate and usage; 0.32 without prescription drug coverage, 0.24 with the coverage) by non-users without the coverage and perhaps greater severity of illness on admission, their total inpatient expense is significantly higher than for non-users with coverage (\$10,099 versus \$4,997). (In fact, users of heart drugs indicate the same pattern—users lacking prescription drug coverage have slightly higher expected usage relative to users with the coverage. Yet their average inpatient total expense is significantly higher. Clearly, differences in utilization do not adequately account for the observed differences in total expenses. Thus, among users, those that lack coverage seem to have greater severity of illness on inpatient admission as compared with those with coverage.) Moreover, lower expected prescription medication usage (18.1 for those without the coverage versus 18.9 for those with the coverage) is offset by higher expected usage of medical provider services, which are usually covered by Medicare or supplemental health insurance (22.5 versus 18.7). The apparent non-use of heart medications due to lack of drug coverage, suggests the existence of a trade-off

between prescription medications and medical practice services. This observation, along with the considerably higher expense of inpatient stays (if any) suggests that for the segment of non-users lacking drug coverage, the provision of some drug coverage may be cost-effective for insurers, including Medicare.<sup>5</sup> Moreover, relative to non-users with prescription medication coverage, those without the coverage are more likely to show one or more of the following characteristics—under age 65, unmarried, rural resident, income less than \$15,000 per year, mental illness, current smoker, poor self-reported health status, and have one or more functional limitation (ADL). Clearly, non-users without drug coverage represent a vulnerable population that merits closer scrutiny by Medicare policymakers and other stakeholders. (A similar comparison among those without drug coverage indicates that the user rates for all services are lower for non-users of heart drugs relative to users. Among users, the extent of usage is also lower for medical provider services and prescription medicines. Likewise, total expense is lower for all services except for hospital outpatient services. Moreover, non-users are more likely to show one or more of the following characteristics—mental illness, pulmonary disease, current smoker, poor self-reported health status, male, disabled, unmarried, and income below \$15,000 per year.)

### Caveats

Several limitations of the previously mentioned analyses deserve comment. Due to data limitations, we account for any drug coverage in our analyses, even though the extent of coverage may vary considerably among those with coverage. In addition, we have not explicitly account-

<sup>5</sup>This comparison does not account for other beneficiary characteristics, such as health status, and thus, must be interpreted with caution.

ed for selection effects in our multivariate models. Because some of our finely defined insurance/drug coverage categories had relatively few observations, we could not conduct separate analyses for each category to better control for selection. Conceivably, beneficiaries who report ever having heart disease may no longer require heart medications due to an improvement in their condition. However, insofar as the heart diseases we study are chronic in nature, we assume heart drugs are prescribed indefinitely. Admittedly, some beneficiaries who consume heart medications may not have heart disease, and to that extent, our estimates of the size of Medicare population with heart disease as well as their cost and use of heart drugs will be inaccurate. Because CMS' method of assigning prescription drugs to generic therapeutic class results in a significant fraction of unclassifiable drugs, if all drug classes are randomly affected, our estimates of heart drug usage and expense may remain unbiased. Finally, in light of some evidence in the literature that indicates that MCBS respondents underreport their use and cost of prescription medications, our statistical estimates may also underestimate the true use and cost. Nevertheless, relative comparisons made within our sample may remain valid.

## **CONCLUSIONS AND POLICY IMPLICATIONS**

Bivariate analyses suggest that the likelihood of consuming heart medication clearly falls in the absence of prescription drug coverage, but the extent of the fall varies by type of supplemental insurance. For beneficiaries with heart disease who enroll in Medicare HMO or have private insurance, lack of drug coverage slightly reduces their likelihood, whereas for those that rely on other public sources of health

coverage (i.e., Medicare FFS-only or the dually eligible beneficiaries), the likelihood falls sharply (Table 3). Moreover, the absence of drug coverage noticeably reduces the number of heart medications and total expense for the latter two groups, suggesting that they represent vulnerable subpopulations (Table 4). For nearly all insurance categories, lack of prescription drug coverage significantly raises out-of-pocket expenses, with the dually eligible beneficiaries exhibiting the largest increase.

Multivariate analyses indicate that for otherwise similar Medicare beneficiaries with heart disease, the likelihood of using heart medications rises with the presence of drug coverage, but unlike the bivariate results, the independent effect of supplemental insurance is not significant (Table 5). Hence, the marked decline in user rates with the absence of prescription drug coverage for dually eligible beneficiaries and Medicare FFS-only beneficiaries (observed in the bivariate analyses) is apparently due to differences in beneficiary characteristics, such as income and health status. In contrast, among users, the extent of utilization of essential heart medications does not depend on either drug coverage or type of supplemental insurance, as previously noted (Tables 6, 7, and 8). Total and out-of-pocket expenses, however, do vary by insurance category and drug coverage. The presence of drug coverage shows the expected effects on (increasing) total costs and (decreasing) out-of-pocket costs. Type of supplemental insurance also influences costs, but not in any consistent manner. *Ceteris paribus*, Medicare HMO enrollees have the lowest total drug expense, perhaps due to favorable selection or pharmaceutical benefit management practices. There are no significant differences in total costs for beneficiaries who rely on Medicare FFS-only or who are dually eligible beneficiaries, groups that follow

**Table 6**  
**Linear Regression of Number of Heart Drugs Used, by Users<sup>1</sup>**

Variable	Model 1				Model 2		
	Mean	Estimate	Standard Error	P-Value <sup>2</sup>	Estimate	Standard Error	P-Value <sup>2</sup>
Intercept		1.34	0.112	0.000	1.34	0.103	0.000
Prescription Drug Coverage	0.755	0.04	0.044	0.418	0.03	0.044	0.437
Medicaid	0.126	0.00	0.085	0.960	0.00	0.084	0.971
Medicare Health Maintenance Organization	0.176	-0.03	0.088	0.703	-0.04	0.087	0.655
Private Employer-Sponsored	0.392	-0.05	0.082	0.562	-0.05	0.077	0.493
Private Individually Purchased	0.247	-0.01	0.071	0.893	-0.02	0.070	0.817
Under 65 Years	0.082	-0.12	0.063	0.067	-0.12	0.058	0.043
75-84 Years	0.371	-0.01	0.038	0.892	NA	NA	NA
85 Years or Over	0.101	0.10	0.049	0.054	0.10	0.044	0.033
Female	0.570	-0.09	0.030	0.004	-0.09	0.029	0.003
Black	0.090	0.02	0.058	0.681	NA	NA	NA
Other Race	0.090	-0.07	0.051	0.165	-0.08	0.048	0.118
Income Less than \$10,000	0.215	0.07	0.046	0.112	0.08	0.042	0.045
\$10,000-\$14,000	0.169	-0.01	0.046	0.897	NA	NA	NA
\$15,000-\$19,000	0.136	-0.03	0.053	0.548	NA	NA	NA
Fair or Poor Self-Reported Health Status	0.297	0.04	0.040	0.318	NA	NA	NA
Instrumental Activities of Daily Living (ADLs)	0.227	0.03	0.045	0.524	NA	NA	NA
1 or 2 ADLs	0.141	-0.01	0.045	0.776	NA	NA	NA
3 or More ADLs	0.065	-0.11	0.073	0.133	-0.11	0.070	0.113
2 Chronic Diseases	0.269	-0.06	0.034	0.075	-0.06	0.034	0.086
3 or More Chronic Diseases	0.058	-0.07	0.059	0.257	-0.07	0.056	0.234
Hypertension	0.784	0.25	0.043	0.000	0.25	0.043	0.000
Diabetes	0.227	0.10	0.037	0.007	0.11	0.036	0.004
Mental Illness	0.058	-0.08	0.073	0.251	NA	NA	NA
Stroke	0.140	0.09	0.043	0.035	0.10	0.043	0.026
Visits to Medical Provider <sup>3</sup>	2.733	-0.03	0.015	0.033	-0.03	0.015	0.040
Number of Other Medications <sup>3</sup>	2.944	0.21	0.022	0.000	0.21	0.021	0.000
				<i>R</i> <sup>2</sup> =0.149			<i>R</i> <sup>2</sup> =0.148

<sup>1</sup> Dependent variable is log-transformed.

<sup>2</sup> Probability > *t* statistic.

<sup>3</sup> For non-categorical variables, the log of the numerical value is used as an independent variable.

NOTES: NA is not applicable. Model 1 estimates the number of heart drugs reported by users of heart drugs, *n*=5,401. Model 2 is a more parsimonious model of the same outcome variable, *n*=5,407.

SOURCE: Sharma, R. and Liu, H., Westat and Wang, Y., American Society of Health System Pharmacists, 2002.

Medicare HMO in exhibiting low total costs on heart drugs. Privately insured beneficiaries indicate higher total expense, because they consume (are prescribed) a more expensive mix of drugs, face higher drug prices, or have more comprehensive drug coverage, *ceteris paribus*. Similarly, even after controlling for health status and other characteristics, individuals with private individually-purchased insurance incur the highest out-of-pocket expense, whereas Medicaid eligibles incur the lowest.

## SUMMARY

Some Medicare beneficiaries with heart disease are likely not to use prescribed heart drugs due to lack of drug coverage. We find non-compliance may lead to severe health consequences requiring the subsequent usage of other insured (and more costly) health services. For those who use heart medications at all, the number of heart drugs consumed is fairly constant, and independent of type of supplemental

**Table 7**  
**Linear Regression of Total Expense of Heart Medications (if Total Expense > 0)<sup>1</sup>**

Variable	Model 1				Model 2		
	Mean	Estimate	Standard Error	P-Value <sup>2</sup>	Estimate	Standard Error	P-Value <sup>2</sup>
Intercept		5.00	0.132	0.000	4.96	0.117	0.000
Prescription Drug Coverage	0.755	0.15	0.063	0.017	0.15	0.063	0.016
Medicaid	0.128	0.02	0.104	0.824	0.01	0.105	0.905
Medicare Health Maintenance Organization	0.177	-0.23	0.097	0.019	-0.22	0.099	0.026
Private Employer-Sponsored	0.389	0.23	0.092	0.016	0.23	0.093	0.017
Private Individually Purchased	0.247	0.11	0.074	0.137	0.11	0.073	0.140
Under 65 Years	0.083	-0.14	0.091	0.136	-0.16	0.086	0.074
75-84 Years	0.371	-0.10	0.053	0.062	-0.11	0.054	0.049
85 Years or Over	0.100	-0.20	0.076	0.011	-0.22	0.076	0.004
Female	0.570	-0.04	0.081	0.363	NA	NA	NA
Black	0.089	-0.12	0.065	0.139	-0.11	0.080	0.169
Other Race	0.090	-0.14	0.042	0.038	-0.13	0.064	0.054
Income Less than \$10,000	0.218	-0.10	0.069	0.135	-0.12	0.068	0.084
\$10,000-\$14,000	0.168	-0.18	0.064	0.007	-0.18	0.063	0.005
\$15,000-\$19,000	0.136	-0.16	0.076	0.038	-0.17	0.077	0.032
Fair or Poor Self-Reported Health Status	0.299	-0.08	0.050	0.126	-0.10	0.047	0.029
Instrumental Activities of Daily Living (ADLs)	0.228	0.03	0.067	0.699	NA	NA	NA
1 or 2 ADLs	0.140	-0.07	0.075	0.387	NA	NA	NA
3 or More ADLs	0.066	-0.13	0.111	0.256	NA	NA	NA
2 Chronic Diseases	0.269	-0.07	0.054	0.192	NA	NA	NA
3 or More Chronic Diseases	0.059	-0.19	0.079	0.016	-0.18	0.079	0.022
Hypertension	0.784	0.34	0.056	0.000	0.33	0.057	0.000
Diabetes	0.228	0.12	0.058	0.036	0.12	0.059	0.041
Mental Illness	0.058	-0.10	0.096	0.280	NA	NA	NA
Stroke	0.141	0.12	0.049	0.016	0.11	0.049	0.031
Visits to Medical Provider <sup>3</sup>	2.732	-0.01	0.030	0.842	NA	NA	NA
Number of Other Medications <sup>3</sup>	2.953	0.16	0.024	0.000	0.15	0.022	0.000
				$R^2=0.104$			$R^2=0.101$

<sup>1</sup> Dependent variable is log-transformed.

<sup>2</sup> Probability > t statistic.

<sup>3</sup> For non-categorical variables, the log of the numerical value is used as an independent variable.

NOTES: Model 1 estimates total expenditures on heart drugs by users having such expenses,  $n=5,405$ . Model 2 is a more parsimonious model of the same outcome variable,  $n=5,405$ . NA is not applicable.

SOURCE: Sharma, R. and Liu, H., Westat and Wang, Y., American Society of Health System Pharmacists, 2002.

insurance or drug coverage. However, total heart drug expense does depend on both factors. Therefore, physician prescribing patterns of existing drugs (i.e., generic versus brand-name), the prices of drugs (i.e., discount or retail), or the extent of drug coverage (if part of the primary supplemental insurance) may vary considerably by type of supplemental insurance. Due to the heterogeneity in the kinds and severity of heart disease in our sample, it is unclear to what extent there are systematic differences in quality of prescribed drugs according to type of insur-

ance and extent of drug coverage: Is quality of drug treatment comparable, as quantity appears to be?

About one-fifth of Medicare beneficiaries identified to have heart disease do not use heart medications and of these, one-third lack drug coverage. Insofar as non-users of heart drugs who have drug coverage do not face a financial access barrier to heart medications, they may choose not to take them. However, some non-use may arise from limited financial access that comes with lack of drug coverage. Thus, some non-users without drug coverage may not

**Table 8**  
**Linear Regression of Out-of-Pocket Expenses on Heart Medications (if Out-of-Pocket Expenses>0)<sup>1</sup>**

Variable	Model 1				Model 2		
	Mean	Estimate	Standard Error	P-Value <sup>2</sup>	Estimate	Standard Error	P-Value <sup>2</sup>
Intercept		4.75	0.140	0.000	4.63	0.128	0.000
Prescription Drug Coverage	0.752	-0.84	0.073	0.000	-0.83	0.073	0.000
Medicaid	0.101	-0.90	0.138	0.000	-0.92	0.130	0.000
Medicare Health Maintenance Organization	0.183	-0.07	0.123	0.583	-0.02	0.119	0.836
Private Employer-Sponsored	0.405	-0.10	0.109	0.387	-0.04	0.103	0.723
Private Individually Purchased	0.250	0.35	0.091	0.000	0.40	0.085	0.000
Under 65 Years	0.079	-0.10	0.111	0.371	NA	NA	NA
75 to 84 Years	0.374	-0.11	0.056	0.051	-0.11	0.054	0.049
85 Years or Over	0.100	-0.08	0.067	0.229	-0.09	0.064	0.172
Female	0.565	-0.05	0.045	0.316	NA	NA	NA
Black	0.089	-0.09	0.083	0.310	NA	NA	NA
Other Race	0.076	-0.08	0.097	0.433	NA	NA	NA
Income Less than \$10,000	0.198	-0.04	0.081	0.590	NA	NA	NA
\$10,000-\$14,000	0.171	-0.08	0.074	0.279	NA	NA	NA
\$15,000-\$19,000	0.139	-0.06	0.077	0.447	NA	NA	NA
Fair or Poor Self-Reported Health Status	0.293	-0.03	0.057	0.545	NA	NA	NA
Instrumental Activities of Daily Living (ADLs)	0.226	0.02	0.064	0.744	NA	NA	NA
1 or 2 ADLs	0.141	-0.06	0.071	0.416	NA	NA	NA
3 or More ADLs	0.064	-0.20	0.110	0.076	-0.20	0.103	0.054
2 Chronic Diseases	0.269	-0.07	0.060	0.248	N/A	N/A	N/A
3 or More Chronic Diseases	0.059	-0.10	0.101	0.341	N/A	N/A	N/A
Hypertension	0.783	0.35	0.061	0.000	0.34	0.062	0.000
Diabetes	0.226	0.10	0.066	0.126	0.10	0.065	0.140
Mental Illness	0.056	-0.26	0.110	0.019	-0.31	0.105	0.004
Stroke	0.141	0.08	0.067	0.262	NA	NA	NA
Visits to Medical Provider <sup>3</sup>	NA	NA	NA	NA	NA	NA	NA
Number of other medications <sup>3</sup>	2.942	0.16	0.026	0.000	0.15	0.025	0.000

R<sup>2</sup>=0.217

R<sup>2</sup>=0.214

<sup>1</sup> Dependent variable is log-transformed.

<sup>2</sup> Probability > t statistic.

<sup>3</sup> For non-categorical variables, the log of the numerical value is used as an independent variable.

NOTES: Model 1 estimates out-of-pocket expenditures reported by users who incurred such expenditures, n=5,204. Model 2 is a more parsimonious model of the same outcome variable, n=5,204. NA is not applicable.

SOURCE: Sharma, R. and Liu, H., Westat and Wang, Y., American Society of Health System Pharmacists, 2002.

have any choice, as they are unable to obtain these medications even if they wish. Relative to non-users with drug coverage, non-users without drug coverage apparently offset their lower expected use of prescription medications by greater expected use of medical provider services. If such beneficiaries are hospitalized, a significantly more costly inpatient stay is likely to result. Thus, extending some form of targeted drug coverage, monitoring compliance to the prescribed regimen, and periodically tracking the health status of these at-risk beneficiaries may generate cost sav-

ings for Medicare (and perhaps other third party insurers as well). However, additional research using longitudinal data is necessary to provide more definitive evidence of this hypothesis.

## TECHNICAL NOTE

### Inpatient Sample Analysis

To validate the presence and severity of heart disease in our sample, we examined the cost and use of heart medicines by beneficiaries who report having heart disease

and also had a hospital stay with primary DRG relating to heart disease in 1998. This resulted in a subsample of 492 beneficiaries. Because of the small sample size, we present our outcome variables by drug coverage only, instead of combinations of insurance category and drug coverage.<sup>6</sup>

About 65 percent of beneficiaries recently hospitalized for heart disease had drug coverage, a rate lower than that of the full sample (73 percent). However, heart drug user rates are higher for the inpatient sample (92 versus 80 percent), perhaps because an inpatient stay suggests that the heart disease is in fact severe. As expected, the average number of heart prescription medications, and the associated total and out-of-pocket expenses are higher than those of the full sample (13.2 versus 10.5, \$542 versus \$465, \$251 versus \$205, respectively). Due to the similarity in the estimates across samples, we infer that the criterion used to identify beneficiaries with a relatively severe heart condition in the full sample (respondent self-reports) was quite successful.

Bivariate analyses indicate that even for beneficiaries with heart disease that has required acute care, drug coverage appears to influence the decision to consume heart medications for some beneficiaries. However, in light of the smaller difference in user rates between those with and without prescription medication coverage in the inpatient sample—relative to that of the full sample (7 versus 11 percentage points)—fewer inpatient sample beneficiaries appear to forgo usage of medications because of lack of drug coverage. For users of heart medications in the inpatient sample, the presence of drug coverage increases both the count (by 2.8 prescriptions) and total expense (by \$201) of heart medications, amounts that exceed the corresponding amounts for the full

<sup>6</sup> For additional information on the inpatient sample, contact the lead author.

sample (0.8 and \$78). Out-of-pocket expenses are reduced with the presence of drug coverage by an amount that is comparable to that of the full sample (\$196 and \$221 respectively). As with the full sample, the out-of-pocket cost burden for heart prescription medications (as a proportion of total cost for heart prescription medications) for those with drug coverage is about one-third the burden for those lacking drug coverage (31 and 95 percent).

Thus, our inpatient sample confirms the relationships specifically between drug coverage and our outcome variables found previously. Moreover, it indicates that as severity of heart disease rises, non-use of heart medications declines (from 20 to 8 percent). Due to inadequate sample size, we could not replicate the previous analyses using both supplemental insurance category and drug coverage. However, some preliminary work suggests that Medicare FFS-only beneficiaries that lack drug coverage are a particularly vulnerable group—their user rate is somewhat lower than the overall average, usage and total expense are well below average, whereas their out-of-pocket burden is more than twice the average. Further research along these lines may be valuable in guiding future Medicare policy for prescription drugs.

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